

1 **Amendment to the Claims**

2 **In the Claims:**

3 Please cancel Claims 14-34, in response to a restriction requirement.

4 Please amend Claims 1 and 5 as follows:

5 1. (Currently Amended) An automated reaction system for continuously performing a  
6 plurality of optimization experiments to enable at least one optimal reaction parameter for a reaction  
7 to be identified, the reaction producing a desired product, comprising:

8 (a) a controller, said controller being configured to monitor and control the system  
9 while continuously performing a plurality of optimization experiments, such that during each of the  
10 plurality of optimization experiments, at least one of a plurality of reaction parameters controlled by  
11 the controller is changed according to a predefined protocol, the plurality of reaction parameters  
12 including at least the parameters of temperature and reactant concentration, the plurality of  
13 optimization experiments enabling optimal reaction parameters to be identified;

14 (b) a reactant supply source for each reactant required for the reaction;

15 (c) a solvent supply source coupled in fluid communication with each reactant  
16 supply source;

17 (d) a dilution pump for each reactant, each dilution pump being coupled in fluid  
18 communication with a corresponding reactant supply source and with the solvent supply source for a  
19 corresponding reactant, and being logically coupled to the controller and operative to vary a  
20 concentration of a corresponding reactant using a solvent;

21 (e) a reaction module having an inlet coupled in fluid communication with each  
22 reactant supply source and the solvent supply source to receive each reactant, and an outlet, the  
23 reaction module being operative to initiate the reaction of the reactants; and

24 (f) at least one analytical unit coupled in fluid communication with the outlet and  
25 logically coupled with the controller, the analytical unit being configured to analyze the desired  
26 product, producing data for the plurality of optimization experiments used to determine at least one  
27 optimal reaction parameter.

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1           2. (Original) The automated reaction system of Claim 1, further comprising a reactant pump  
2 for each reactant required for the reaction, each reactant pump being logically coupled to the  
3 controller and operative to provide a flow of a corresponding reactant to the inlet of the reaction  
4 module.

5           3. (Original) The automated reaction system of Claim 1, further comprising at a plurality of  
6 residence time chambers, each resident time chamber being configured to be coupled in fluid  
7 communication between the outlet of the reaction module and the analytical unit.

8           4. (Original) The automated reaction system of Claim 3, wherein the controller carries out a  
9 plurality of functions, including:

10                 (a) directing a flow of fluid from the outlet of the reaction module sequentially  
11 into each of the plurality of residence time chambers;

12                 (b) directing a flow of fluid from the outlet of a last of the plurality of residence  
13 time chambers, which is last to sequentially receive the flow of fluid from the outlet, into the  
14 analytical unit;

15                 (c) obtaining data from the analytical unit for a fluid exiting the last residence time  
16 chamber; and

17                 (d) after data have been obtained from the analytical unit for the fluid exiting the  
18 last of the plurality of residence time chambers, carrying out a further plurality of functions,  
19 including:

20                         (i) isolating the last of the plurality of residence time chambers from the  
21 analytical unit;

22                         (ii) directing a flow of fluid from the outlet of a preceding residence time  
23 chamber into the analytical unit; and

24                         (iii) obtaining data from the analytical unit for a fluid exiting the preceding  
25 residence time chamber.

26           5. (Currently Amended) The automated reaction system of ~~Claim 4, wherein the plurality of~~  
27 ~~functions carried out by the controller include directing a flow of fluid from the outlet of the reaction~~  
28 ~~module into the analytical unit, such that such that data corresponding to the flow of fluid from the~~  
29 ~~outlet of the reaction module is collected~~ Claim 1, wherein the predefined protocol comprises at least  
30 one of:

1           (a) implementing a plurality of optimization experiments in which each reaction  
2 parameter has been predefined;

3           (b) implementing a plurality of optimization experiments in which each reaction  
4 parameter is varied between a predefined maximum value and a predefined minimum value based on  
5 a predefined function; and

6           (c) implementing a plurality of optimization experiments in which each reaction  
7 parameter in an initial set of optimization experiments is predefined, and in which at least one  
8 reaction parameter in a later set of optimization experiments is determined based on results from the  
9 initial set of optimization experiments.

10           6. (Original) The automated reaction system of Claim 1, further comprising a heat exchanger  
11 configured to thermally condition each reactant entering the reaction module, the heat exchanger  
12 being logically coupled to and controlled by the controller.

13           7. (Original) The automated reaction system of Claim 6, wherein the controller controls a  
14 flow of a temperature conditioned fluid through the heat exchanger to vary a thermal condition in the  
15 reaction module over time, such that the analytical unit collects data corresponding to a plurality of  
16 different thermal conditions in the reaction module, to determine an optimal thermal condition for the  
17 reaction.

18           8. (Original) The automated reaction system of Claim 1, wherein the controller controls each  
19 dilution pump to vary a concentration of each reactant over time, such that the analytical unit collects  
20 data corresponding to a plurality of concentrations of each reactant, to enable an optimal  
21 concentration of each reactant to be identified for the reaction.

22           9. (Original) The automated reaction system of Claim 1, wherein the controller controls a  
23 plurality of reaction parameters according to a periodic pattern, such that the analytical unit collects  
24 data corresponding to a plurality of values for each reaction parameter, to determine an optimal value  
25 for each reactant parameter.

26           10. (Original) The automated reaction system of Claim 9, wherein the controller varies the  
27 predefined pattern based on the data produced by the analytical unit.

28           11. (Original) The automated reaction system of Claim 9, wherein the controller  
29 simultaneously varies at least two reaction parameters based on a periodic function.

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1           12. (Original) The automated reaction system of Claim 11, wherein each of the at least two  
2 reaction parameters are varied by the controller according to different periodic functions.

3           13. (Original) The automated reaction system of Claim 12, wherein the controller further:

4               (a) evaluates the data produced by the analytical unit after each of the at least two  
5 reaction parameters are varied according to their respective periodic functions;

6               (b) identifies new upper and lower boundaries for at least one of the at least two  
7 reaction parameters;

8               (c) based on the new upper and lower boundaries, redefines at least one periodic  
9 function; and

10              (d) simultaneously varies each of the at least two reaction parameters based on the  
11 periodic functions, using each that has been redefined.

12           Claims 14-34 (Cancelled)

13           Please add new Claims 35-38 as follows:

14           35. (New) The automated reaction system of Claim 1, wherein the controller implements the  
15 following functions:

16               (a) uses a baseline value for each reaction parameter to generate the desired  
17 product;

18               (b) determines at least one of a quantity and a quality of the desired product  
19 generated using the baseline values;

20               (c) changes the baseline value for at least one reaction parameter, thereby  
21 affecting the desired product being produced by the automated system; and

22               (d) determines at least one of a quantity and a quality of the desired product  
23 generated using the at least one baseline value that was changed.

24           36. (New) The automated reaction system of Claim 1, wherein the controller implements the  
25 following functions:

26               (a) uses a baseline value for each reaction parameter to generate the desired  
27 product;

28               (b) determines at least one of a quantity and a quality of the desired product  
29 generated using the baseline values;

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1 (c) changes the baseline value for at least one reaction parameter according to a  
2 linear function, thereby affecting the desired product being produced by the automated system; and  
3 (d) determines at least one of a quantity and a quality of the desired product  
4 generated using the at least one baseline value that was changed, such that if data corresponding to at  
5 least one of a quantity and a quality of the desired product generated using the at least one baseline  
6 value that was changed is indicative of a linear discontinuity, then for each value corresponding to a  
7 linear discontinuity, defining that value as a baseline value and repeating functions (a) - (d).

8 37. (New) An automated reaction system for continuously performing a plurality of  
9 optimization experiments to enable at least one optimal reaction parameter for a reaction to be  
10 identified, the reaction producing a desired product using at least two reactants, comprising:

11 (a) a controller, said controller being configured to monitor and control the system  
12 while performing optimization experiments;

13 (b) a reactant supply source for each reactant required for the reaction;

14 (c) a solvent supply source coupled in fluid communication with each reactant  
15 supply source;

16 (d) a dilution pump for each reactant, each dilution pump being coupled in fluid  
17 communication with a corresponding reactant supply source and with the solvent supply source for a  
18 corresponding reactant, and being logically coupled to the controller and operative to vary a  
19 concentration of a corresponding reactant using a solvent, such that the concentration of each reactant  
20 can be varied independently of the concentration of each other reactant;

21 (e) a reaction module having an inlet coupled in fluid communication with each  
22 reactant supply source and the solvent supply source to receive each reactant, and an outlet, the  
23 reaction module being operative to initiate the reaction of the reactants; and

24 (f) at least one analytical unit coupled in fluid communication with the outlet and  
25 logically coupled with the controller, the analytical unit being configured to analyze the desired  
26 product, producing data for the plurality of optimization experiments used to determine at least one  
27 optimal reaction parameter.

28 38. (New) A method for using a continuously running system to determine at least one  
29 optimal reaction parameter for a reaction to produce a desired product, comprising the steps of:

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1 (a) identifying a plurality of reaction parameters to be varied, at least one reaction  
2 parameter comprising a concentration of a reactant utilized to obtain the desired product;  
3 (b) for each reaction parameter, identifying a plurality of values to be assigned to  
4 the reaction parameter;  
5 (c) selecting a baseline value for each of the reaction parameters from the plurality  
6 of values identified for each reaction parameter;  
7 (d) using the baseline values to generate the desired product in a continuously  
8 running reaction system;  
9 (e) determining at least one of a quantity and a quality of the desired product  
10 generated using the baseline values;  
11 (f) changing the baseline value for at least one reaction parameter, thereby  
12 affecting the desired product being produced by the continuously running system, such that where the  
13 baseline value to be changed comprises a concentration of a reactant utilized to obtain the desired  
14 product, the baseline value is changed by utilizing a dilution pump to vary a concentration of that  
15 reactant by adding a solvent to the reactant;  
16 (g) determining at least one of a quantity and a quality of the desired product  
17 generated using the at least one baseline value that was changed; and  
18 (h) comparing the at least one of the quantity and the quality of the desired product  
19 generated before changing the at least one of the baseline value with a corresponding at least one of  
20 the quantity and the quality of the desired product generated after the step of changing, to determine  
21 the at least one reaction parameter responsible for generating the highest of at least one of the  
22 quantity and the quality of the desired product.  
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